

Claims

1. An optical ring network structure comprising:
- two or more network elements, and
 - a single optical fibre connection between each pair of neighbouring network elements for carrying an optical signal,
- wherein the ring network structure is arranged in a manner such that, in use, band allocation utilising multiplexing on each single fibre connection is chosen in a manner such that groups of wavelengths for bi-directional data transfer and for bi-directional redundant data transfer for protection respectively are provided on each single fibre connection.
2. An optical ring network structure as claimed in claim 1, wherein the optical ring network structure comprises MUX/DEMUX means located at each network element for multiplexing and de-multiplexing the optical signal, depending on the propagation directions of the respective wavelengths in the optical signal with respect to the MUX/DEMUX means.
3. An optical ring network structure as claimed in claim 2, wherein the MUX/DEMUX means comprises a 3-port circulator disposed to combine counterpropagating traffic from a unidirectional multiplexer means and to a unidirectional de-multiplexer means of the MUX/DEMUX means.
4. An optical ring network structure as claimed in claim 2, wherein the MUX/DEMUX means comprises a bi-directional multiplexer/de-multiplexer means.
5. An optical ring network structure as claimed in ^{claim 1} ~~any one of the preceding claims~~, wherein the MUX/DEMUX means comprises a dense WDM MUX/DEMUX and a coarse WDM MUX/DEMUX, wherein the coarse WDM MUX/DEMUX is disposed in a manner such that, in use, it drops and adds certain wavelength bands at the network element to and from the fibre connections to further demultiplexing and from multiplexing by the dense WDM MUX/DEMUX.
6. An optical ring network structure as claimed in ^{claim 1} ~~any one of the preceding claims~~, wherein the optical ring network structure is arranged in a manner such that the data transfer and the redundant data transfer are transmitted concurrently.

7. An optical ring network structure as claimed in claim 6, wherein the ring network structure comprises means for selecting between receipt of either the data transfer or the redundant data transfer located at each network element.

8. An optical ring network structure as claimed in claim 7, wherein the means for selecting comprises a switch.

9. An optical ring network structure as claimed in claim 7, wherein the means for selecting comprises amplifiers for the received data transfer and the received redundant data transfer respectively.

10. An optical ring network structure as claimed in ~~any one of claims 1 to 5~~, wherein the optical ring network structure is arranged in a manner such that the redundant data transfer is transmitted only in response to a failure.

11. An optical ring network structure as claimed in claim 10, wherein the optical ring network structure is arranged in a manner such that pre-emptible data is being transmitted on the groups of wavelengths provided for the redundant data transfer when the optical ring network structure is in normal operation.

12. An optical ring network structure as claimed in ~~claims 10 or 11~~, wherein the system comprises switching means located at each network element for switching from data transfer to redundant data transfer.

13. An optical ring network structure as claimed in claim 12, wherein the switching means is disposed between the dense WDM MUX/DEMUX and the coarse WDM MUX/DEMUX.

14. An optical ring network structure as claimed in ~~any one of the preceding claims~~, wherein the propagation directions of alternating groups of wavelengths with respect to the ring network structure are opposed to one another.

15. An optical ring network structure as claimed in claim 14, wherein the groups of wavelengths each comprise a single transmission channel.

16. An optical ring network structure as claimed in claim 14, wherein each group of wavelengths comprises a band of transmission channels.

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17. An optical ring network structure as claimed in any one of the preceding claims, wherein the optical ring network structure comprises two or more optical fibre connections between each pair of neighbouring network elements, wherein the ring network structure is arranged in a manner such that, in use, band allocation utilising multiplexing on each one of the single fibre connections between each of the pairs is chosen in a manner such that groups of wavelengths for bi-directional data transfer and for bi-directional redundant data transfer for protection respectively are provided on each single fibre connection.

18. A method of distributing data on a optical ring network structure, the optical ring network structure comprising two or more network elements, the method comprising the step of:

- distributing a bi-directional multiplexed optical signal on single optical fibre connections between each pair of neighbouring network elements,

wherein band allocation utilising multiplexing on each single fibre connection is performed in a manner such that groups of wavelengths for bi-directional data transfer and for bi-directional redundant data transfer for protection respectively are provided on each single fibre connection.

	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2
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